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Notes and Comments

Sampling Location in Cortical Bone Histology

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Pfeiffer et al. (1995) focus on the impact of bone sampling location on the estimation of adult age at death because the consequences of cortical bone dynamics are observable throughout a histological section. The authors also remark that, despite the variability in remodeling pattern around the circumference of a cross-section and between the subperiosteal and endosteal borders, the subperiosteal cortex of the femoral midshaft has been a favored sampling site for age estimation.

In 1987 Drusini considered the variation in the density of the microstructures along the circumference of a complete femur section (including the *linea aspera*). He reported the distribution of the number of secondary osteons per field along the circumference of a complete section in three femurs of known age and sex (Table 1). Because the methods proposed by various authors (Kerley, 1965; Alhqvist and Damsten, 1969; Singh and Gunberg, 1970; Thompson, 1978, 1979) contained intrinsic errors, Drusini sought a more accurate valuation of the variability in the spatial distribution of microstructures used for age determination. The great variability in the distribution of osteons allowed the observation of a large number of fields (10–20, depending on bone conditions and with the exclusion of the *linea aspera*) to compute the age-dependent variables, using the mean values of each section.

Drusini was aware that the endosteal cortex exhibits higher values of secondary osteon density, but his aim was to compare different methods for histologic age determination. All methods were based on the bone periosteal border. Undeniably, the correlations found between bone microstructure density and real age using the periosteal border were high, especially for the mandible (Drusini and Businaro, 1990; Alciati et al., 1994; Drusini and Bovo, 1995; Drusini and Medves, 1995). Further investigations based on the endosteally located cortex were carried out for comparison (data not published), but less heterogeneous sampling locations were not found.

These findings indicate that sampling location alone cannot resolve the problems caused by variability in the turnover of cortical bone remodeling, at least until the causes of significant locational and field differences are established.

The "core technique" described by Thompson (1979) "is subject to criticism because it does not take into consideration the variations of density of the microstructures in the different parts of a given section" (Drusini, 1987:175). Even the "point technique" described by Thompson (1979) seems not free of ambiguity. In fact, on condition that the dimensions of the secondary osteons diminish with age, as Thompson (1978) affirms, and that inevitably some of the osteons are positioned obliquely in respect to the viewing angle, the apparent surface areas do not always correspond to their number. The computation of the number of microstructures per unit of surface area, instead of the calculation of the area they occupy, eliminates this inconvenience.

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TABLE 1. Variation in the density of the bone microstructures along the circumference of three complete femur sections (after Drusini, 1987, modified)

N specimen	Known age	Average N osteons per field (Ø 1.52 mm)	Range	SD	CV
1,586	19	13.36	2–21	5.44	40.72
1,439	35	16.09	8–23	3.89	24.18
1,483	50	22.31	18–28	2.74	12.28

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